AN OVERVIEW OF BASIC DATA ON THE BOSNIAN-HERZEGOVINIAN PLECOPTERA SPECIES

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PREGLED OSNOVNIH PODATAKA O BOSANSKO-HERCEGOVAČKIM VRSTAMA PLEKOPTERA

Abstrakt

Bosna i Hercegovina se nalazi u središnjem dijelu sjevernog umjerenog pojasa. Ona se nalazi u jugoistočnom dijelu Evrope, u središnjem dijelu Balkanskog poluotoka. Najveći dio Bosne i Hercegovine hidrografski pripada crnomorskom slivu odnosno porječju rijeke Save. Sava svoje najveće pritoke prima upravo iz Bosne (Una, Vrbas, Bosna, Drina). Manji hercegovački prostor odvodnjava se prema Jadranskom moru.

U radu su analizirani postojeći literaturni podaci o zastupljenosti vrsta reda Plecoptera u Bosni i Hercegovini. Na temelju svih raspoloživih podataka, može se zaključiti da je u Bosni i Hercegovini vrlo širok stupanj biološke raznolikosti vrsta iz reda Plecoptera, zbog čega se Bosna i Hercegovina općenito svrstava u bogatija područja Evrope.

Zbog ekstremne osjetljivosti ličinki na smanjene koncentracije kisika, kao i osjetljivost na toksične tvari u vodi i promjene u strukturi staništa, upravo se ova skupina vodenih insekata koristi u biološkim procjenama kakvoće površinskih voda kao pokazatelj zdravih potoka i rijeka (metod biološkog indeksa).

Ključne riječi*: Bosna i Hercegovina*, *Plecoptera, bioraznolikost, endem*

INTRODUCTION

Plecoptera include soft body insects, which size can vary from 4 mm to 5 cm. They have two pairs of wings but they are weak fliers. Commonly found along the water in

which they live their larvae stages, mostly in pure water, under rocks. To date, about 2000 described species of Plecoptera were classified into 15 families (Matoničkin, 2001).

Antennas Plecoptera are long, have complex eyes and two or three ocels. Lip of the appliance is adapted for nibbling. Of three thoracic segments protoraks is larger and mobile. The legs are strong with a pair of three-member tarsus and claws. Wings are membranacea; last are almost always larger than the front. The abdomen has 11 segments and a pair of multi daughter. (Krunić 1986, Brajković, 2004).

Intestinal system begins with ear hole, followed by long esophageal, stomach is rudimentisan or absent, and the mean and the rectum is short. The hose empties 20-60 Malpigijevih courts. Trachea system is open to the external environment over 10 pairs of stigmas. Nervous system consists of the brain, three pairs of thoracic and 6 to 8 pairs of abdominal ganglia. Male genital system is composed of pairs of testes which start seminal ducts joining the central ejaculation channel. Female reproductive system is composed of pairs, which are based on ovarian fallopian tubes that are opened through the gonopore and usually have spermateku (Krunić, 1986).

In former Yugoslavia by the number of species Plecoptera do not get behind vretenica (Odonata) or water flowers (Ephemeroptera), but still, it is little known about them. In our country, they have attracted attention in recent years even at the turn of this century. So far in Bosnia, there are 75 known Plecoptera species. This figure incorporates B&H in general among the richer areas of Europe.

MATERIALS AND METHODS

Information on the *Plecoptera* in Bosnia and Herzegovina in this paper are based on existing literature (Klapalek 1898, 1901, 1906, 1906a; Pongracz 1913, 1914; Aubert 1963, 1964; Kaćanski i Zwick 1970; Zwick 1978; Kaćanski 1970, 1971, 1978, 1983, 1989).

RESULTS AND DISCUSSION

This section presents the results of previous studies of order *Plecoptera* in Bosnia and Herzegovina. All data provided by districts to facilitate comparison of species composition.

All endemic species *Brachyptera* colonize springs and spring creeks, but they are more or less spread in the upper parts of ritrona. Slightly broader distribution in relation to habitat conditions are manifested by *Brachyptera graeca*. It was found at various altitudes of about 530-1400 m. Based on previous findings *Brachyptera graeca* is widespread in Macedonia, Kosovo, Montenegro and Bosnia and Herzegovina. *Brachyptera helenica* sites are known in Serbia, Bosnia and Herzegovina, Macedonia, at elevations 530-1150 m. *Brachyptera tristis* has been recorded in all parts of Yugoslavia except Macedonia. This species colonizes a strong karst springs in the karst area, and may be defined as species characteristic for the type of already mentioned streams. *Brachyptera beale* is widespread in the southern Balkans, and was observed in the mountains Maglić, Volujak and Zelengora at an altitude above 1000 m.

Table 1. Comparative review of the total number of species and subspecies and portion of Balkan endemic species in the basin of Bosnia and Herzegovina:

	Number of species	Number of subtype	Endemic species
BOSNA	51	1	*Brachyptera tristis* (Balkan)
			Brachyptera graeca (Balkan)
			Isoperla albanica (Albania)
			Chloroperla russevi (Balkan)
			Leuctra hippopoides (Greece, Yugoslavia)
			Leuctra signifera jahorinensis (Dinaridi)
DRINA	42	1	*Brachyptera beali* (southern Balkan)
			Brachyptera helenica (Balkan)
			Leuctra olympia (Greece)
			Leuctra aptera (BiH)
			Leuctra hippopoidea (Greece, Yugoslavia)
			Leuctra procera (BiH and Serbia)
			Isoperla albanica (Albania)
			Siphonoperla neglecta graeca (Balkan)
			Chloroperla russevi (Yugoslavia)
The upper DRINA flow	52	1	*Brachyptera graeca* (Balkan)
			Brachyptera helenika (Balkan)
			Brachyptera tristis (Balkan)
			Leuctra hippopoides (Greece,Yugoslavia)
			Leuctra olympia (Greece)
			Isoperla albanica (Albania)
			Siphonoperla n.graeca (Balkan)
			Chloroperla russevi (Yugoslavia)
SANA	1		
LASVA	5		
VRBAS	33	1	*Leuctra hippopoides* (Greece,Yugoslavia)
			Isoperla tripartita obliqa (Greece)
NERETVA	28	1	*Brachyptera graeca* (Balkan)
			Brachyptera helenica (Balkan)
			Brachyptera tristis (Balkan)
			Leuctra olympia (Greece)

Leuctra aptera is designated as endemic to the Dinaric Alps, but it is the same as *Leuctra jahorinensis* and it can be considered as an endemo of Bosnia and Herzegovina. Only typical habitats of this species are known so far (Kaćanski & Zwick, 1970; Kaćanski 1970). It was found in three small spring creeks that flow into Sutjeska at an altitude of about 900 m. A new sites of *Leuctra jahorinensis* species have not been found than those where the typical examples take their origin. They are the Praca Vrh and source Paljanska Miljacka (Kaćanski, 1972). The two mentioned localities belong to different basins, one in a mountain complex and another in the pinewood (*Picetum montanum*). *Leuctra hippopoides* type is quite widespread in streams of Bosnia and Herzegovina, it was found at several sites in Serbia. It colonizes clear streams primarily spring at an altitude of 550-1400 m. *Leuctra olympia*, according to previous data, is widespread in streams of Macedonia, Montenegro, Serbia and Bosnia and Herzegovina (Ikonomov, 1969; Kaćanski 1970, 1978, 1980).

Isoperla albanica is described from specimens collected in Skala Bicajt in Albania. According to the previously published data, it was found in Serbia, Montenegro and Bosnia and Herzegovina (Kaćanski, 1970,1971,1976; Sivec, 1980). It colonizes larger spring streams and those that match ritronu mountain streams, mostly at higher elevations 730-1650 m. *Isoperla intermis* species sites are known only in running the Dinaric mountain system. It has been recorded in the area holokarsta Bosnia and Herzegovina, and Croatian (Kaćanski & Zwick, 1970; Kaćanski, 1972, 1978). *Isoperla tripartita obliqa* is described accirding to the specimens collected in Greece. It is assumed to be distributed widely in the Dinarides, however, the material within this species requires revision, which will complement data on the distribution of the Balkan subspecies.

Siphonoperla neglecta graeca is recorded in Macedonia (Ikonomov, 1969), Montenegro (Kaćanski & Baumann, 1981) and Bosnia and Herzegovina, where it was found in the massif of Zelengora mountain (Kaćanski, 1970). Typical site of *Chloroperla russevi* is Rila Mountains in Bulgaria. In Yugoslavia, so far it is established in Macedonia (Ikonomov, 1976) and in a few places in Bosnia (Kaćanski 1970, 1971). It is a resident of the spring creeks in the higher altitudes of about 100 m to over 1600 m.

CONCLUSIONS

The results of this study can be summarized in a few conclusions:

- 75 species and subspecies have been found in the investigated catchments. Analyzing the data obtained by specifying materials for watershed Plecoptera, 51 species and one subspecies are related to the Bosna River Basin, at the confluence of the Drina (Maglić mountain resort, and Volujak Zelengora) 42 species and one subspecies, the upper basin of the river Drina 52 species and one subspecies , at the confluence of the Vrbas River, 33 species and one subspecies, the Neretva River basin belongs to 28 species and one subspecies, the basin Lasva 5 species and one type of basin drainage area. It can be concluded that in Bosnia and Herzegovina, there is a very wide degree of biological species diversity of Plecoptera order, which incorporates Bosnia and Herzegovina into the richer areas in Europe.
- So far in the villages of Bosnia and Herzegovina 13 Plecoptera species and subspecies have been recorded that are endemic to the Balkans. *Leuctra aptera* is designated as endemic to the Dinaric Alps, but as *Leuctra signifer jahorinensis* is considered as an endemo of Bosnia and Herzegovina

Nine species and two subspecies *Brachyptera beale*, *Brachyptera helenica*, *Brachyptera graeca*, *Brachyptera tristis*, *Leuctra hippopoides*, *Leuctra olympia*, *Leuctra procera*, *Isoperla albanians*, *Isoperla triparitia obliqa*, *Siphonoperla neglecta graeca* and *Chloroperla russevi*, according to today understanding of their distribution only inhabited the Balkan Peninsula, and are now considered endemic to this area. It is important to emphasize the site of *Isoperla intermis* species, endemic to the Dinarides, which can be treated as a characteristic species for sources in the Bosnian-Herzegovinian holokarsta, where in some places reaches a high density population. *Perla pallida* has also been recorded known in the Caucasus, the Carpathians and Asia Minor. Glogovka the first and so far the only site of its kind in Bosnia and Herzegovina has been recorded, too. Type *Taenopteryx kultreiberi* in Bosnia and Herzegovina has been recorded so far only in the Lasva basin.

- It is necessary to re-collect Plecoptera in the territory of Bosnia and Herzegovina, to make the determination, and then form a modern database of images, with emphasis on diagnostic characteristics of the studied taxa. Various aspects of human activity, such as for example deforestation, and various pollution greatly endanger the natural habitat types of the order Plecoptera. As a result of these and similar phenomena in some localities there is impoverishment of the population or even disappearance of *Plecoptera* including endemic species. Thus keeping the natural habitat is the most important measures to protect gene pool of these insects.

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